INFLUENCE OF OCEAN CURRENTS ON THE MIOCENE PLATFORM DEMISE (YEAR 2)

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PROJECT OBJECTIVES

- Test if ocean currents affect the demise of Miocene carbonate platforms by:
  - Assessing synchrony of current onset and platform demise by constraining the timing of both events.
  - Identifying similarities between the drowning successions of the Kardiva Platform (Maldives), Marion Plateau (Australia), west-Florida shelf edge, and the Miami Terrace.
  - Providing chemical evidence that nutrient influx did not cause the demise of the carbonate platform.

PROJECT RATIONALE

Carbonate platform drowning is a common phenomenon in the carbonate system for which many theories exist, including global anoxic events, fast sea-level rise, tectonic break-up, and by the negative influence of nutrient excess on reefs (Hallock and Schlager,1986). However, evidence also exists for the close relationship between platform demise and intensification of ocean currents. For example, the platforms on the Marion Plateau stopped growing at the same time as ocean currents started to be diverted along the eastern

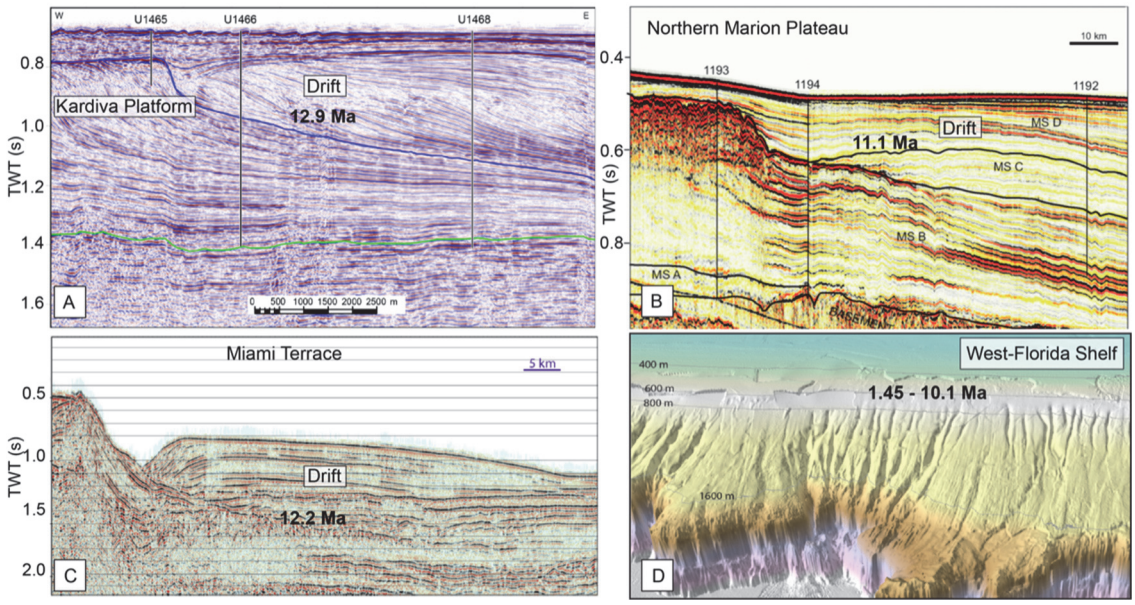

Figure 1: Drowned platforms and drift deposits used to test the influence of currents on platform demise. A) Kardiva Platform Maldives; B) Northern Marion Platform (Australia); C) Miami Terrace (Florida); D) Edge of West Florida Shelf. The ages indicate the onset of the drift deposit in A-C; in D) ages are from hardground samples.

side of Australia (John and Mutti, 2005; Eberli et al., 2010). Likewise, the onset of monsoon-related currents is correlated with the partial drowning of the platforms in the Maldives (Betzler et al. 2009). Mullins and Neumann (1979) proposed that the backstepping of the Florida platform that formed the Miami Terrace was caused by the intensification of the Florida Current. Similarly, the origin of hardgrounds on the West Florida shelf edge is attributed to the Loop Current. In this study, we test if currents alone were responsible for the platform demise or if increased up-welling and, thus, increased nutrient supply during current intensification aided in the process.

APPROACH

To show a causal relationship between platform drowning and current intensification we plan to precisely date the onset of the current and the top of the drowned platform. Biostratigraphic data from IODP Expedition 359 (Maldives) and ODP Legs 101, 166 (Bahamas) and 194 (Marion Plateau) provides the ages for the onset of the drifts (Figure 1). Sr-isotope dating is used to date the drowning successions on the platforms. Synchrony of hardground formation and drift onset would provide evidence of the influence of currents on the demise of these platforms.

Thin section analyses of the platform tops will indicate if the platform was exposed before the demise or if drowning occurred during a sea-level rise. Geochemical signatures (Iron and Phosphorus) and proxies for nutrients (Barium and Cadmium) from XRF analysis will be obtained from both current and platform deposits to evaluate if nutrient supply increased with current intensification. The nitrogen isotope ratio ($\delta N^{15}/\delta N^{14}$) of the Kardiva Platform sediments will also be determined. Any changes in geochemical signature will reveal if there was an influx of nutrients at the time of platform drowning.

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